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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/446,144

03/02/2000

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P5634

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51500 7590 04/15/2008
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EXAMINER

GREENE, DANIEL LAWSON

ART UNIT

PAPER NUMBER

3694

MAIL DATE

DELIVERY MODE

04/15/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 09/446,144	Applicant(s) RUBBIA, CARLO	
	Examiner DANIEL L. GREENE	Art Unit 3694	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-6,8-17,19-22 and 24-49 is/are pending in the application.
- 4a) Of the above claim(s) 10,11,13-16,26,27,29,30 and 33-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,8,9,19-22,24,25,28,31,32 and 49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/24/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114 Applicant's submissions filed on 5/2/2007 and 1/9/2008 have been entered.

2. NOTE: The abandonment mailed 10/3/2006 is hereby rescinded as applicant timely filed an RCE.

3. Claims 1, 2, 4-6, 8-17, 19-22 and 24-49 are pending. Claims 10, 11, 13-16, 26, 27, 29, 30 and 33-48 are withdrawn. Accordingly an action on the merits of claims 1, 2, 4-6, 8, 9, 19-22, 24, 25, 28, 31, 32 and 49 follows.

Information Disclosure Statement

4. The IDS submitted 10/24/2007 has been considered and is attached to the instant communication.

Oath/Declaration

5. Applicant submitted a declaration from Mr. Yacine Kadi (10/17/2007) in an attempt to overcome the 35 USC 112 rejections pending in the instant application by

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demonstrating that one of ordinary skill in the art would indeed understand the definition of the term “transparent”, “impurities”, “inner” and “outer” buffer regions. Applicant was informed that Mr. Kadi’s declaration was nothing more than an opinionated declaration and should have or been modified to utilized evidence and actual proof to support his allegations and opinions as set forth in section 3 of the 7/27/2007 Office correspondence,

“Since applicant is relying on the affidavit to overcome the rejections of record, then the Examiner is allowing applicant time to properly submit said evidence before a determination will be made. Further, Mr. Kadi should attempt to direct his allegations and opinions in a more factual direction. That is, TO BE OF PROBATIVE VALUE, ANY OBJECTIVE EVIDENCE SHOULD BE SUPPORTED BY ACTUAL PROOF and not merely opinion. See MPEP 716.01(b).I. and II, etc.”

It is not seen wherein Mr. Kadi set forth any factual evidence or actual proof in support of his opinions. Accordingly, said declaration fails to overcome the examiners contentions set forth in the previous Office actions and fails to set forth the metes and bounds of the knowledge level of one of ordinary skill level in the transmutation art. Mr. Kadi's statements alone without presentation of factual proof can only be construed as an opinion. Again, per MPEP 716.01(b).1 and II., no patentable weight can be given to an opinionated declaration. Consequently, said declaration cannot be relied upon as an adequate response to the issues presented in the previous Office communication mailed 12/2/2005.

No weight is given to an opinion declaration on the ultimate Legal conclusion in issue. See In re Lindell, 155 USPQ 251. See also In re Pike et al, 84 USPQ 235.

Response to Arguments

6. Applicant's arguments filed 5/2/2007 and 11/24/2006 have been fully considered but they are not persuasive.

A. Regarding sections 1-4 on pages 7 and 8 of applicant's 11/24/2006 response, it is immaterial that applicant removed the adjective modifier "substantially" from the term "transparent" within claims 1 and 17. The fact remains that the claims contain the limitation "transparent" which the specification fails to show support for, as expounded upon below.

The Kadi declaration has already been commented on above and fails to provide support for applicant's arguments as explained therein.

Further, it appears that the Board agrees with the Examiner that there is no support for the term "transparent" in the following excerpt from page 5 of the 9/20/2006 Board decision.

"In fact, as pointed out by the examiner, it is unclear what is meant by the term transparency in that the specification defines transparency as a property of a medium in which neutrons undergo mostly elastic scattering. When the claim language of a "substantially transparent" medium is considered in light of the definition of transparency in the specification of being a property of a medium in which neutrons undergo "mostly elastic scattering," it is our opinion that the claims fail to define the metes and bounds of the claimed invention with a reasonable degree of precision and particularity. Therefore, we will sustain this rejection as it is directed to claim 1..."

It appears that a majority of Applicant's arguments and basis of appeal are rooted on the definition of "transparent" and what exactly is the "diffusing medium".

Applicant argues that the definition of "transparency" set forth in the specification in one full sentence is clearly defined. That being transparent is meant as the property of a medium in which neutrons undergo mostly elastic scattering (specification page 2, lines 30-32).

The examiner disagrees. Applicant within the specification pages 2-3 sets forth his transparency definition as being two steps, (1) and (2). Applicant correctly sights only part of step (1). Step (1) is further expounded upon on page 3, lines 3+ of the specification wherein Applicant further cites a doping of the diffusing medium making it "cloudy" and consequently allowing for neutron

capture by the subject impurities. Neutron capture by Applicant's own definition occurs within the diffusing medium. Therefore the diffusing medium is truly not elastic.

Even if one were to accept Applicant's definition of transparent, there is no adequate description or enabling disclosure of what all is meant and encompassed by the term **mostly** elastic. The specification provides no relevance of what **mostly** elastic is construed to be, i.e., $2/3$, $5/8$, $3/4$, etc. Mostly only involves greater than $1/2$. However, no standard is set forth by Applicant.

The examiner referring to the definition of transparency (Per A glossary of Terms in Nuclear Science and Technology, 1957 the term transparency is defined as being to permit the passage of radiation particles) has clearly shown Applicant's definition to not be consistent with that set forth in the art. *That is, no mention of elastic or inelastic scattering is present in the definition* [emphasis added]. Applicant by defining his transparency in relation to elastic scattering has set forth a definition repugnant to the accepted definition within the art. While Applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See In re Hill, 161 F.2d 367, 73 USPQ 482 (CCPA 1947).

Principles of Nuclear Reactor Engineering, sets forth that lead and bismuth (both of Applicant's diffusing medium materials) act like light nuclei with respect to inelastic scattering. That is light nuclei tend to not undergo inelastic scattering; however, there is no standard set forth by Applicant what constitutes

mostly elastic scattering, i.e., $2/3$, $5/8$, $3/4$, etc. Thus, while hydrogen may undergo no interactions, heavier nuclei in comparison to hydrogen, such as Oxygen do. Likewise lead and/or bismuth also undergo some inelastic scattering. There is no indication of what is an acceptable level of inelastic scattering within Applicant's disclosure. Thus, as set forth previously, the specification is insufficient in defining how and in what manner Applicant achieves **mostly** *elastic* scattering in his diffusing medium when the prior art indicates that the materials in question (i.e., lead/bismuth), be it slight or great, act as inelastic scatterers.

As set forth above Applicant adds material impurities to his diffusing medium to make it "cloudy". By doing so neutron capture occurs by the subject impurities. Thus, neutron capture is occurring within the diffusing medium. Again as previously set forth inelastic scattering is occurring within Applicant's diffusing medium. That is Applicant's diffusing medium is not mostly elastic scattering and therefore by Applicant's own definition is not substantially transparent.

As before there is no adequate description nor enabling disclosure of the parameters of the specific operative embodiments of the invention. Particularly the diffusing medium as set forth on page 3, lines 3+ of the specification discloses impurities present in the diffusing medium that account for a "cloudy effect" that allows for most of the neutrons to be captured by said impurities. There is no indication of the exact density and ratio of impurities within the

diffusing medium. Furthermore it is not seen wherein what constitutes said impurities. Thus without said impurities the diffusing medium cannot function as claimed. That is the transparency of the Applicant's diffusing medium depends on said impurities. Without such knowledge of what constitutes said impurities, their ratio, density, etc. within the diffusing medium one cannot replicate Applicant's claimed invention.

Applicant argues that in the context of the disclosure, it is evident that the "impurities" which "dope" the diffusing medium consist of the material for which exposure to a neutron flux is looked for in the claimed method. Applicant cites that the increased neutron capture efficiency is achieved with the help of the nature and of the geometry of the medium surrounding the source, in which a small amount of the element to be transmuted ("impurities") is introduced in a diffused way ("doped"). Those skilled in the art immediately understand that what would make the medium "cloudy" in the optical analogy is the isotope in which neutron capture is expected.

The examiner disagrees for the reasons set forth above. No amounts of impurities are set forth. One skilled in the art cannot ascertain such. Applicant's definition of transparency as pointed out above is inconsistent with the accepted meaning. Even Applicants own definition is contradicted. Mostly elastic yet doped to provide inelastic properties.

Lastly in regard to the transparent diffusing medium. It appears now based on Applicant's arguments that only a select few mediums are possible

(i.e., lead and/or bismuth). Thus claim 1 appears to be broader than the enabling disclosure as not all transparent medium can be used in Applicant's invention to achieve the desired results. As set forth above one cannot replicate Applicant's claimed invention without knowledge of what constitutes the diffusing medium including the impurities, their ratio, density, etc.

Again, Applicant is correct in citing the MPEP 2173.05 (a) wherein the specification states the meaning that a term in the claim is intended to have, the claim is examined using that meaning. However, Applicant cites only a portion of the claimed transparency definition. The specification Pages 2-3 disclose two steps (1) and (2). Step (1) (page 3, lines 3+) further cites a doping of the diffusing medium making it "cloudy" and consequently allowing for neutron capture by the subject impurities. Thus, as specified by Applicants own specification neutron capture is occurring within the diffusing medium. Therefore the diffusing medium is truly not elastic.

Per "A glossary of Terms in Nuclear Science and Technology", 1957 the term transparency is defined as being to permit the passage of radiation particles. No mention of elastic or inelastic scattering is present in the definition. While Applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See In re Hill, 161 F.2d 367, 73 USPQ 482 (CCPA 1947).

B. Regarding sections 5 and 6 on pages 8-10 of said 11/24/2006

response, Applicant is correct in that during patent prosecution, the pending claims must be given the broadest reasonable interpretation and as such the terms “inner” and “outer” buffer regions are vague and indefinite. In Applicant’s specification and drawings there are two distinct and separate buffers (Fig. 7a, items 3 and 5). While the buffers can be the same material they are separate. This is evident by the activity volume (thin tubes) located between the two buffer layers. From the specification and drawings (figure 7b, items 12 and 16) there appears to be no intermixing of the two buffers.

The claim language reads on a single buffer having an inner and outer layer or region. Clearly, this is not the same as two separate and distinct buffers having diffusing medium located therein, hence the claims are indefinite as they read on BOTH two separate and distinct buffers (inner and outer) AND a single buffer having an inner and outer region.

C. Regarding section 7 on pages 10-12 of said 11/24/2006 response, it appears applicant is under the impression that the molten salt blanket of Bowman “does not enhance the neutron flux in contrast to the diffusing medium of the present invention” because “Neutron capture and fission take place within the molten sale (sic) blanket medium.” (Page 11, second paragraph).

This interpretation is incorrect and directly contradicts applicant’s own inventive concept. It is not clear how Applicant can perceive Bowman not to read on the claimed inventive concept. The molten salt of Bowman IS the first

diffusing medium doped with beryllium to enhance neutron multiplication.

Therefore, the first diffusing medium of Bowman is transparent to neutrons. That is the first diffusing medium of Bowman is transparent in accordance with the accepted meaning in the art (permit passage of radiation or particles). Bowman's first diffusing medium permits the passage of neutrons to interact with the to be exposed material. Even if Applicant's definition (mostly elastic) were considered to be correct Bowman meets this as well. The first diffusing medium of Bowman being mostly elastic or transparent to neutrons.

On pages 16-17 of the Appeal Brief received 9/19/2005 Applicant attempts to define the molten salt blanket medium of Bowman as incorporating fertile and fissile materials and as such cannot be considered as being "mostly elastic". However for the same reasons as Applicant discloses in said 9/19/05 appeal brief on page 8, lines 12-18 it is apparent that it is the exposed material that captures the neutrons and not the diffusing medium itself, i.e. the molten salt.

The Handbook of Chemistry and Physics and "neutron Scattering and cross sections" both teach the properties of the molten salts proposed in Bowman, column 11 lines 38 and 39 and therewithin it is specifically disclosed that said molten salt is "for the transport of dissolved...into and out of the recirculation loop". Clearly this has parallels to the instant invention's use of molten lead for the same purpose. Both Bowman and the instant invention disperse the material to be exposed to the neutron flux inside the diffusion medium, See for example the specification page 2 lines 8-14. Applicant's

attempts to define the blanket material of Bowman as containing fuel material and fertile or fissile materials are equally applicable to his own invention and as such are not persuasive. Again, upon review of the neutron capture cross sections and scattering cross section of the materials of the molten salt (i.e. diffusing medium) of Bowman, it is apparent that the scattering cross section is on the order of about two magnitudes larger than the absorption cross section. For example, according to page 513 of The Handbook of Chemistry and Physics, Bi (Bismuth) has a scattering cross section of 9 ± 1 barns while its neutron capture cross section is 34 ± 2 mb (millibarns) or $.034 \pm .002$ barns, thus the propensity of Bismuth atoms is to “scatter” neutrons instead of “absorb” neutrons, hence it is apparent that said materials are indeed “transparent” to neutrons even by applicant’s own definition.

It is noted that the claims do NOT specify any time during operation that said conditions must exist, therefore it can also be considered that the period of startup of Bowman, before any materials are incorporated into the molten salt, reads on the claim language. Even if the initial startup is not perceived to read on the claim language, the point at which the molten salt has been scrubbed of fission products and reintroduced into the reactor is also considered as reading on the claimed invention.

Although Bowman does not specifically state the use of a “transparent” medium, as defined by the applicant, as explained above, the molten salt of Bowman is indeed transparent and functions in the same manner as the neutron-

diffusing medium of the instant invention as the molten salt is simply the "buffer" or "transport medium" for the material to be "transmuted".

D. Regarding sections 8 and 9 on pages 12 and 13 of said 11/24/2006 response, no response is required as applicant's arguments hinge on the base rejection of Bowman which reads on applicant's invention as explained above.

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Double Patenting

8. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

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1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Applicant is advised that should claim 1 be found allowable, claim 49 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof.

When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Applicant's 1/9/2008 amendment to the claims required this rejection.

11. Claims 1, 2, 4-6, 8, 9, 12, 17, 19-22, 24, 25, 28, 31-32 and 49 are rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-33 of prior U.S. Patent No. 5,774,514.

This is a double patenting rejection. The language of claims 1, 2, 4-6, 8, 9, 12, 17, 19-22, 24, 25, 28, 31-32 and 49 of the instant invention merely describe the same method in the patent only using different terms and manner of describing the invention, however, upon critical analysis of the theory behind and method of transmutation, the invention set forth in U.S. Patent No. 5,774,514

appears to be exactly what applicant is attempting to claim. Applicant's 5/2/2007 amendment to the claims required this rejection.

For applicant's convenience the claimed limitations have been more carefully mapped to the patented claims at issue as set forth below.

Instant Application Claim 1	U.S. Patent 5,774,514
A method of transmuting at least one long-lived isotope of a radioactive waste, comprising the steps of:	A method of producing energy from a nuclear fuel material including a fertile element, comprising the steps of:
providing a neutron-diffusing medium around a neutron source, wherein the diffusing medium includes an inner buffer region and an activation region surrounding said inner buffer region, the activation region being made of heavy elements including at least one of lead and/or bismuth;	<p>"arranging said fuel material within an enclosure"</p> <p>This reads on the "enclosure" set forth in the claims. See, for examples, Figure 20 and 21 and Col. 40 lines 21+.</p> <p>The "buffer zone" reads on item 127.</p> <p>The "activation region" reads on item 128. Note that the molten lead circulates through the main core to remove heat. See. Col. 40 lines 30-37.</p> <p>Further, see Col. 39 lines 53+ wherein it is set forth that Bismuth is a natural byproduct when Lead is bombarded by protons. So the "medium" will INHERENTLY contain both Lead AND Bismuth.</p>
distributing a material containing said long-lived isotope in the activation region of the	arranging said fuel material within an enclosure also containing heavy nuclei. (See Figures 20 and 21)

neutron-diffusing medium; and	
activating the neutron source to emit a neutron flux, whereby neutron scattering within the diffusing medium substantially enhances the neutron flux to which the material is exposed.	<p>directing a high energy particle beam into the enclosure, whereby interaction of said particle beam with said heavy nuclei contained in the enclosure produces high energy spallation neutrons;</p> <p>multiplying the neutrons produced by said directing step by a steadily sub-critical process of breeding of a fissile element from said fertile element of the fuel material via a beta-precursor of said fissile element and fission of the fissile element, said breeding and fission process being carried out inside the enclosure</p>

Per MPEP 2144.04 Legal Precedent as Source of Supporting Rationale [R-1] II.

ELIMINATION OF A STEP OR AN ELEMENT AND ITS FUNCTION

A. Omission of an Element and Its Function Is Obvious If the Function of the Element Is Not Desired.

Although claim 1 may not REQUIRE the use of fuel material claim 1 discloses “distributing A MATERIAL” (emphasis added). It is old and well known that nuclear fuel material inherently includes/contains some sort of radioactive

waste as it is impossible to prevent it (nuclear fuel/material) from naturally decaying. Further although claim 1 does not explicitly set forth using a particle beam, it is generic and worded so broadly that it reads on the invention set forth in claim 1 of patent '514.

12. Claims 1, 2, 4-6, 8, 9, 12, 17, 19-22, 24, 25, 28, 31-32 and 49 provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claim 49 of copending Application No. 10/985323.

This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Rejections - 35 USC § 112

13. The specification is objected to under 35 U.S.C. 112, first paragraph, as failing to provide an adequate written description of the invention and as failing to adequately teach how to make and/or use the invention, i.e. failing to provide an enabling disclosure.

a. There is no adequate description nor enabling disclosure of the parameters of the specific operative embodiments of the invention. Particularly the diffusing medium as set forth on page 3, lines 3+ of the specification discloses impurities present in the diffusing medium that account for a "cloudy effect" that allows for most of the neutrons to be captured by said impurities.

There is no indication of the exact density and ratio of impurities within the diffusing medium. Furthermore it is not seen wherein what constitutes said impurities. Thus without said impurities the diffusing medium cannot function as claimed. That is the transparency of the Applicant's diffusing medium depends on said impurities. Without such knowledge of what constitutes said impurities, their density ratio to each other, density, etc. within the diffusing medium one cannot replicate Applicant's claimed invention.

b. Applicant defines the term (neutron) transparency contrary to the established definition in the art. Thus, there is no indication of how and in what manner Applicant ascertains his transparency definition and why this differs from the accepted norm. That is one skilled in the art would not associate elastic scattering only with transparency. See the discussion of Mr. Kadi's declaration above.

For the reasons set forth above the examiner has set forth a reasonable and sufficient basis for challenging the adequacy of the disclosure. The statute requires the Applicant to inform, not to direct others to find out for themselves; In re Gardner et al, 166 U.S.P.Q. 138, In re Scarbrough, 182 U.S.P.Q. 298. Note that the disclosure must enable a person skilled in the art to practice the invention without having to design structure not shown to be readily available in the art; In re Hirsch, 131 U.S.P.Q. 198.

14. Claims 1, 2, 4-6, 8, 9, 12, 17, 19-22, 24, 25, 28, 31-32 and 49 are rejected under 35 U.S.C. 112, first paragraph for the reasons set forth in the section immediately above.

15. Claims 1, 2, 4-6, 8, 9, 12, 17, 19-22, 24, 25, 28, 31-32 and 49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. The term "inner buffer region" in claims 1, 17 and 49 is a relative term, which renders the claims indefinite. The term "inner buffer region" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. As is the claims are indefinite.

B. The term "outer buffer region" in claims 5 and 20 is a relative term, which renders the claim indefinite. The term "outer buffer region" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. As is the claims are indefinite.

C. With regard to claims 1 and 17 and the term "transparent" the claims are vague, indefinite and incomplete, particularly in regard as to what is meant by and encompassed by the term. This is further expounded upon in the objection to the specification set forth above.

Claim Rejections - 35 USC § 102

16. Claims 1, 2, 4-6, 8, 9, 12, 17, 19-20, 24, 25, 28 and 49 are rejected under 35 U.S.C. 102(b) as being anticipated by Bowman (5,160,696).

Bowman (see entire document) discloses an apparatus capable of meeting Applicant's claimed inventive concept and anticipates independent claims 1, 17 and 49.

Referring to figure 4 Bowman discloses a transmutation system wherein a material (actinide waste, fission products, Tc⁹⁹, I¹²⁹ etc.) stored in container (98) is subjected to a neutron flux produced a high-energy particle beam (80) on a spallation target. The exposed material of container (98) is distributed in a first neutron diffusing medium (molten salt) surrounding the neutron source (80), the first neutron diffusing medium being transparent to the produced neutrons and arranged so that the neutron scattering properties of the diffusing medium substantially enhance the neutron flux originating from the source to which the material exposed.

NOTE: the molten salt of Bowman contains beryllium (Be) a known neutron multiplier, thus the molten salt of Bowman further enhances the neutron flux of the source, even further, the molten salt contains lead and bismuth (identical to applicant's invention) and therefore enhances the neutron flux in the same manner as applicant's invention.

With regard to claim 2 and the distance, occupied by the first diffusing medium, between the neutron source (80) and the exposed material (98) being at least one order of magnitude larger than the diffusion coefficient for elastic neutron scattering with the first diffusing medium it appears inherent that the physical separation of the neutron source (80) and the container (98) provides at the minimum the specified distance.

As to limitations which are considered to be inherent in a reference, note the case law of In re Ludtke, 169 U.S.P.Q. 563,. In re Swinehart, 169 U.S.P.Q. 226; In re Fitzgerald, 205 U.S.P.Q. 594,. In re Best et al, 195 U.S.P.Q. 430; and In re Brown, 173 U.S.P.Q. 685, 688.

The first diffusing medium of Bowman further provides for the diffusing medium (molten salt) to contain heavy elements (see column 11, lines 22+), thus neutron interactions with said heavy elements would result in slowing energies of the neutrons originating from the neutron source.

Regarding claims 4-6 and 19, Bowman further discloses a deuterated water moderator (44) surrounding a portion of the diffusing medium (molten salt). Note that Bowman discloses two diffusing mediums. The first medium being the molten salt as set forth above. The second being the liquid metal (Pb-Bi) spallation target being free of exposed material (98) and located between the moderator (44) and the diffusing medium (molten salt).

Additionally note that Bowman further provides for extraction of useful isotopes and the extraction of heat via a heat exchanger/turbine system.

Regarding claim 9, See fig 4 and corresponding text description (See, for example, col. 11 lines 1+)

While patent drawings are not drawn to scale, relationships clearly shown in the drawings of a reference patent cannot be disregarded in determining the patentability of claims. See In re Mraz, 59 CCPA 866, 455 F.2d 1069, 173 USPQ 25 (1972).

17. Claims 1, 17 and 49 rejected under 35 U.S.C. 102(a) as being anticipated by US 6,442,226 to Venneri et al. (Venneri).

Regarding claims 1, 17 and 49, Venneri sets forth a method of both exposing a material to a neutron flux AND to produce a useful isotope (ABSTRACT), the method comprising the steps of:

- providing a neutron-diffusing medium (Fig. 9 (22)) around a neutron source, wherein the diffusing medium is substantially transparent to neutrons and includes an inner buffer region and an activation region surrounding said inner buffer region, the activation region being made of heavy elements including at least one of lead and/or bismuth;

- distributing said material containing said long-lived isotope in the activation region of the neutron-diffusing medium (Fig. 9 and Col. 10 lines 52-61); and activating the neutron source to emit a neutron flux, whereby neutron scattering within the diffusing medium substantially enhances the neutron flux, to which the material is exposed in, for example, Col. 2 lines 52+, etc.

Claim Rejections - 35 USC § 103

18. Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowman ('696) as applied to claims 1, 2, 4-6, 8, 9, 12, 17, 19-20, 24, 25, 28 and 49 above and further in view of Borst (3,197,375).

As set forth above Bowman discloses Applicant's inventive concept; however, Bowman does not disclose the use of carbon as a moderating material.

Borst teaches the use of carbon/graphite as a neutron moderating material in the same field of endeavor for the purpose of enhancing nuclear reactions by slowing neutrons to thermal energies in, for example column 1, lines 33+.

Although Borst does not disclose the particular dimensions set forth by Applicant for his moderator it is within the skill level of the ordinary artisan to optimize the moderator to promote the desired end result, i.e. the amount of moderation, etc. Here such would be the transmutation of the exposed material. See MPEP 2144.05 11 (A) - Optimization within the prior art conditions.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the transmutation system of Bowman to have included the carbon/graphite moderator teachings of Borst as such results are in no more than the utilization of conventionally known moderating materials within the nuclear art.

19. Claims 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowman ('696) as applied to claims 1, 2, 4-6, 8, 9, 12, 17, 19-20, 24, 25, 28 and 49 above and further in view of Ruddock (4,123,497).

As set forth above Bowman discloses Applicant's inventive concept; however, Bowman does not disclose the transmutation of radioisotope Mo^{98} to Tc^{99} .

Ruddock teaches the transmutation of Mo^{98} via neutron capture in a nuclear reactor environment in the same field of endeavor for the purpose of producing medically beneficial radioisotope Tc^{99} . Ruddock further teaches the exposed material Mo^{98} being in a phosphomolybdate complex salt being in an alumina matrix from which Tc^{99} is extracted. See entire document.

Clearly, transmutation of Mo^{98} by neutron activation is obvious as is evident by the teachings of Ruddock. One skilled in the nuclear art would realize the substitution of one transmutation material for another. That is the substitution of Mo^{98} into the container (98) holding the transmuted material of Bowman would have been obvious to one having ordinary skill in the art at the time the invention was made as such results are in no more than the utilization of conventionally known methods neutron activation within the nuclear art.

20. Claims 1, 17 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,160,696 to Bowman in view of US 6,442,226 to Venneri.

Regarding claims 1, 17 and 49, Bowman sets forth a method of transmuting at least one long-lived isotope of a radioactive waste, by exposing a

material containing said long-lived isotope to a neutron flux, the method comprising the steps of:

- providing a neutron-diffusing medium (Fig. 4) around a neutron source, wherein the diffusing medium is substantially transparent to neutrons and includes an inner buffer region and an activation region surrounding said inner buffer region, the activation region being made of heavy elements including at least one of lead and/or bismuth (Col. 8 lines 12-16);
- and activating the neutron source to emit a neutron flux, whereby neutron scattering within the diffusing medium substantially enhances the neutron flux, to which the material is exposed in, for example, the Abstract, the figures, Col. 11 lines 2-57, etc.

If applicant is of the opinion that Bowman does not explicitly set forth distributing said material containing said long-lived isotope in the activation region of the neutron-diffusing medium, then resort may be had to the teachings of Venneri to show that such would be an obvious thing to do.

Venneri teaches in, for example, col. 1 line 25 through Col. 2 line 20 that it is known in the nuclear transmutation arts to **place the material to be transmuted within** an area of the reactor with **the highest possible neutron flux in order to maximize the probability of neutron absorption and transmutation.**

Accordingly, at the time of the invention it would have been obvious to one of ordinary skill in the art to apply the teachings of Venneri to the invention of Bowman.

Such teachings would lead one to place the material containing the long lived isotopes within the molten liquid lead itself in order to minimize the loss of neutron population and maximize the transmutation rate due to the increased neutron density.

21. Claims 1, 17 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 3,349,001 to Stanton in view of US 6,442,226 to Venneri.

Regarding claims 1, 17 and 49, Stanton sets forth a method of transmuting at least one long-lived isotope of a radioactive waste, by exposing a material containing said long-lived isotope to a neutron flux, the method comprising the steps of:

- providing a neutron-diffusing medium (Fig. 1 (20)) around a neutron source, wherein the diffusing medium is substantially transparent to neutrons and includes an inner buffer region and an activation region surrounding said inner buffer region, the activation region being made of heavy elements including at least one of lead and/or bismuth;
- and activating the neutron source to emit a neutron flux, whereby neutron scattering within the diffusing medium substantially enhances the neutron flux, to which the material is exposed in, for example, Col. 2 line 49- Col. 4 line 41, etc.

Stanton does not appear to explicitly set forth distributing said material containing said long-lived isotope in the activation region of the neutron-diffusing medium.

Venneri teaches in, for example, col. 1 line 25 through Col. 2 line 20 that it is known in the nuclear transmutation arts to place the material to be transmuted within an area of the reactor with the highest possible neutron flux in order to maximize the probability of neutron absorption and transmutation.

Accordingly, at the time of the invention it would have been obvious to one of ordinary skill in the art to apply the teachings of Venneri to the invention of Stanton. Such teachings would lead one to place the material containing the long lived isotopes within the molten liquid lead itself in order to minimize the loss of neutron population and maximize the transmutation rate due to the increased neutron density.

Conclusion

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL L. GREENE whose telephone number is (571)272-6876. The examiner can normally be reached on Mon-Thur.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James P. Trammell can be reached on (571) 272-6712. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3694

23. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. L. G./
Examiner, Art Unit 3694
2008-04-12

/James P Trammell/
Supervisory Patent Examiner, Art Unit 3694